

# PATENT ABSTRACTS OF JAPAN

(11)Publication number : 05-024190

(43)Date of publication of application : 02.02.1993

(51)Int.Cl. B41J 2/045  
B41J 2/055

(21)Application number : 03-182736

(71)Applicant : FUJI ELECTRIC CO LTD

(22)Date of filing : 24.07.1991

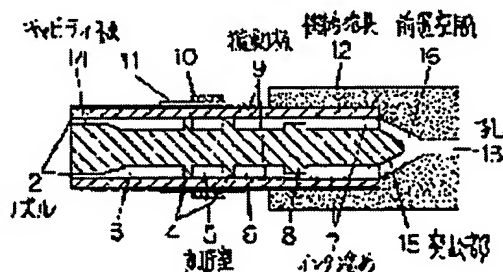
(72)Inventor : SASAKI KOSUKE  
MATSUMOTO HIROZO

## (54) INK JET RECORDING HEAD

### (57)Abstract:

**PURPOSE:** To prevent the entrainment or stagnation of a bubble to improve a recording quality by a construction wherein in a prespace to which ink reservoirs are connected and ink is led from the external, a flow cross sectional area and a flow direction between an inlet and an outlet are gradually changed.

**CONSTITUTION:** Ink supply paths 6 and jet flow paths 3 are formed in a cavity plate 14 so as to connect to ink reservoirs 7, ink pressurizing chambers 5, and ink jetting nozzles 2. On each surface of the cavity plate 14, a vibration plate 9 is bonded at one surface thereof. A piezoelectric element 10 is fixed on the other surface of the vibration plate 9 opposedly to the ink pressurizing chamber 5. Furthermore, a prespace 16 is connected to the ink reservoirs 7, and ink is led into the prespace from the external. In this structure, the prespace 16 is branched at an inlet part of a hole 13 in a supply jig 12 and connected to the respective ink reservoirs 7, whereby the cross sectional area thereof is gradually changed. In addition, in the branched part of the prespace 16, a projection part provided in the cavity plate 14 is disposed.



## LEGAL STATUS

[Date of request for examination] 15.05.1997

[Date of sending the examiner's decision of rejection]

[Kind of final disposal of application other than the withdrawal]

examiner's decision of rejection or application  
converted registration]

[Date of final disposal for application] 09.06.2000

[Patent number]

[Date of registration]

[Number of appeal against examiner's decision of  
rejection]

[Date of requesting appeal against examiner's  
decision of rejection]

[Date of extinction of right]

Copyright (C); 1998,2003 Japan Patent Office

\* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

CLAIMS

---

[Claim(s)]

[Claim 1] The cavity plate with which the slot a common ink reservoir, and an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed in a front face; It is joined to the slot side front face of this cavity plate in respect of one side. The diaphragm which a piezoelectric device fixes in the location which counters said each ink pressurized room in respect of another side; In a recording head equipped with the front-end space to which it is open for free passage with said ink reservoir, and ink flows into and is supplied from the outside, and; Said front-end space is the flow cross-sectional area between said inflow opening and outflow opening to said ink reservoir, and an ink jet recording head characterized by being formed so that a flow direction may change slowly.

[Claim 2] In a recording head according to claim 1 a cavity plate The slot an ink reservoir common to each front face of the both sides, and an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed, and between one inflow opening of front-end space, and outflow opening which leads to the ink reservoir by the side of said each front face The ink jet recording head characterized by preparing the central separation wall for bisecting the ink style from said inflow opening, and guiding the ink reservoir by the side of said each front face respectively.

[Claim 3] In a recording head according to claim 1 a cavity plate The slot an ink reservoir common to each front face of the both sides, and an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed. Each two inflow openings of front-end space, The ink jet recording head characterized by preparing the septum object which isolates two ink styles to said outflow opening of the side which outflow opening which leads to the ink reservoir by the side of said each front face corresponds, and corresponds from said each inflow opening in said front-end space.

---

[Translation done.]

## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DETAILED DESCRIPTION

---

## [Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the ink jet recording head which prevents the contamination of the air bubbles which may happen from the exterior through front-end space at the time of the ink supply to an ink reservoir especially, and the retention, and plans upgrading of record.

[0002]

[Description of the Prior Art] The approach of recording by injecting ink and making it adhere on record media, such as paper, from a detailed nozzle hole conventionally is learned as the ink jet record approach. And there is an on-demand mold ink jet recording head as one of the principle of the. The double-sided form ink jet recording head of this method It is what arranges the nozzle for ink jet alternately to both sides in order to obtain high resolution. As shown in drawing 5 which is the top view generally seen from the slot side of a cavity plate, and drawing 4 which is a sectional view The cavity plate 1 which formed two or more nozzles 2 for ink injection, the injection passage 3, the ink pressurized room 5, the ink supply way 6, and the common ink reservoir 7 in both sides of plate members, such as silicon, glass, or a metal plate, by etching, machining, etc., The structure where the piezoelectric device 10 as an electric machine sensing element is joined through the conductive film 11 by the location which counters the ink pressurized room 5 of the lateral surface of a diaphragm 9 in a diaphragm 9 after unifying, a laminating and is taken. Furthermore, in order to have established the filter passage 8 of the almost same depth as a nozzle 2, and width of face in the part which connects the ink supply way 6 and the ink reservoir 7 and to make flow of ink smooth at the inlet port and outlet of the ink pressurized room 5, and in order to prevent a becoming bored lump of a diaphragm 9, the island-like projection 4 is formed.

[0003] In addition, the supply fixture 32 which is the rubber mold goods or the plastic part of the shape of (it indicated by the two-dot chain line in drawing 5 at the top section) and a KO character is inserted in the right end section of drawing 4 in sealing, and it pastes up. The hole 33 by which the ink tube which is not illustrated is connected to the supply fixture 32 is opened, and the front-end space 35 which is open for free passage to this is formed in the form which leads to the ink reservoir 7. This front-end space 35 is literally installed in the preceding paragraph of the ink reservoir 7, and has a buffer function, i.e., the function which eases the vigor of ink, to the ink flowed and supplied from a hole 33.

[0004] If the electrical potential difference as an electrical signal is impressed to a piezoelectric device 10 in such structure, a diaphragm 9 will displace inside the ink pressurized room 5, the volume of the ink pressurized room 5 will be decreased rapidly, the ink equivalent to a part for the volume will be injected from a nozzle 2, and it becomes an ink droplet, and it will make it the recording paper which counters point arrival, and will be printed.

[0005]

[Problem(s) to be Solved by the Invention] In the conventional example, it sets to drawing 4, and the ink flowed and supplied from a hole 33 collides with the right end side of the cavity plate 34, and serves as a turbulent flow thru/or a vortex in the front-end space 35 interior, the air bubbles then generated are involved in the ink reservoir 7, and there is a possibility of \*\*\*\*ing. When [ extreme ] it invades into \*\* ink pressurized room 5 and the nozzle 2 from which smooth supply of the ink passing through \*\* slot is prevented, and smooth ink injection is checked and a quality of printed character deteriorates with these air bubbles, the problems that printing becomes intermittent, such as --, occur.

[0006] The technical problem of this invention is to offer the ink jet recording head which cancels the above trouble which a Prior art has, prevents the contamination of the air bubbles which may happen from the exterior through front-end space at the time of the ink supply to an ink reservoir, and the retention, and plans upgrading of record.

[0007]

[Means for Solving the Problem] The ink jet recording head concerning claim 1 The cavity plate with which the slot a common ink reservoir, and an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed in a front face; It is joined to the slot side front face of this cavity plate in respect of one side. The diaphragm which a piezoelectric device fixes in the location which counters said each ink pressurized room in respect of another side; In a recording head equipped with the front-end space to which it is open for free passage with said ink reservoir, and ink flows into and is supplied from the outside, and; Said front-end space is formed so that the flow cross section between said inflow opening and outflow opening to said ink reservoir and a flow direction may change slowly.

[0008] The ink jet recording head concerning claim 2 In a recording head according to claim 1 The ink reservoir with a cavity plate common to each front face of the both sides, The slot an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed, and between one inflow opening of front-end space, and outflow opening which leads to the ink reservoir by the side of said each front face The central separation wall for bisecting the ink style from said inflow opening, and guiding the ink reservoir by the side of said each front face respectively is prepared.

[0009] The ink jet recording head concerning claim 3 In a recording head according to claim 1 The ink reservoir with a cavity plate common to each front face of the both sides, The slot an ink pressurized room and the nozzle for ink injection come to be open for free passage of a slot is formed. Each two inflow openings of front-end space, The septum object which isolates two ink styles to said outflow opening of the side which outflow opening which leads to the ink reservoir by the side of said each front face corresponds, and corresponds from said each inflow opening is prepared in said front-end space.

[0010]

[Function] In the ink jet recording head concerning claim 1 thru/or either of 3, since it is formed so that the flow cross section between opening for an inflow of front-end space and outflow opening to an ink reservoir and a flow direction may change slowly, the ink which is flowed and supplied to front-end space and flows into an ink reservoir serves as flow with the comparatively ready elementary stream.

[0011] In the ink jet recording head concerning especially claim 2, the ink which passed along one inflow opening, and was flowed and supplied to front-end space is bisected by the central separation wall, serves as flow with the comparatively ready elementary stream, and flows into the ink reservoir by the side of each front face.

[0012] In the ink jet recording head concerning especially claim 3, while it had been isolated by two flow with the septum object, the ink which passed along two inflow openings, and was flowed and supplied to front-end space serves as flow with the elementary stream which was comparatively ready, respectively, and flows into the ink reservoir by the side of each corresponding front face.

[0013]

[Example] The example of the ink jet recording head concerning this invention is explained referring to drawing below. The sectional view of the 1st example and drawing 2 are the same, and drawing 1 is the top view of the cavity plate. This 1st example corresponds to claim 2. The point that the 1st example differs from the conventional example shown in drawing 4 and drawing 5 is in the configuration of the flow path in front-end space of resulting in each ink reservoir from the hole for an ink inflow of a supply fixture. That is, the front-end space 16 takes the form where branch to two and it results in each ink reservoir 7 from inflow opening of the hole 13 of the supply fixture 12, and it is made for change of the cross section to become slow in drawing 1. And the lobe 15 (it is equivalent to the central separation wall in invention) of 3 corniform of the right end section of the cavity plate 14 is located in a part for the tee, and it supports forming each fork road. The configuration where the internal surface of the front-end space 16 which results in each ink reservoir 7 from inflow opening of the hole 13 of the supply fixture 12 was seen superficially is a sector-like as shown by the two-dot chain line of drawing 2.

[0014] Therefore, the ink which passed along one hole 13, and was flowed and supplied to the front-end space 16 is bisected by the lobe 15 equivalent to a central separation wall, serves as flow with the comparatively ready elementary stream, and flows out of the front-end space 16 into the ink reservoir 7 by the side of each front face. Consequently, the contamination of the air bubbles which may happen through the front-end space 16 at the time of the ink supply to the ink reservoir 7, and the retention are prevented, as a result upgrading of record can be planned. By the way, the same work and effectiveness can be demonstrated by forming the lobe of front-end space or a cavity plate according to drawing 1 also at the time of the method with which a nozzle is arranged like the 1st example only in one field unlike the method arranged to both sides of a cavity plate.

[0015] Drawing 3 is the sectional view of the 2nd example. This 2nd example corresponds to claim 3, and record of

two different colors is possible for it. The flow path in front-end space where the hole for an ink inflow of a supply fixture results in each ink reservoir from those with two piece and its each is isolated completely, and it is made for the point that the 2nd example differs from the 1st example shown in drawing 1 and drawing 2 to become slow in change of the cross section of each flow path moreover. That is, in drawing 3, each front-end space 26 takes the isolated form where it results in each ink reservoir 7 which corresponds, respectively from two holes 23 of the supply fixture 22. The isolation is performed by the plate-like lobe 25 (it is equivalent to the septum object in invention) of the right end section of the cavity plate 24. The superficial configuration of the internal surface of the front-end space 26 which results in each ink reservoir 7 from inflow opening of each hole 23 of the supply fixture 22 applies to the two-dot chain line display of the top view of drawing 2 correspondingly.

[0016] Therefore, by the lobe 25, it is isolated completely, and the ink which passed along two holes 23, and was flowed and supplied to the front-end space 26 serves as flow with the elementary stream which was moreover comparatively ready, and flows into the ink reservoir 7 by the side of each front face. Consequently, the contamination of the air bubbles which may happen at the time of the ink supply to the ink reservoir 7 which corresponds through each front-end space 26, and the retention are prevented, as a result upgrading of record can be planned.

[0017]

[Effect of the Invention] In the ink jet recording head concerning claim 1 thru/or either of 3, since it is formed so that the flow cross section between opening for an inflow of front-end space and outflow opening to an ink reservoir and a flow direction may change slowly, the ink which is flowed and supplied to front-end space and flows into an ink reservoir serves as flow with the comparatively ready elementary stream. Consequently, the contamination of the air bubbles which may happen from the exterior through front-end space at the time of the ink supply to an ink reservoir, and the retention are prevented, and upgrading of record can be planned.

[0018] In the ink jet recording head concerning especially claim 2, the ink which passed along one inflow opening, and was flowed and supplied to front-end space is bisected by the central separation wall, serves as flow with the comparatively ready elementary stream, and flows into the ink reservoir by the side of each front face. Therefore, record with the sufficient quality of the same color is performed from the nozzle of both sides.

[0019] In the ink jet recording head concerning especially claim 3, while it had been isolated by two flow with the septum object, the ink which passed along two inflow openings, and was flowed and supplied to front-end space serves as flow with the elementary stream which was comparatively ready, respectively, and flows into the ink reservoir by the side of each corresponding front face. Therefore, record with the sufficient quality of the same color or two different colors is performed from the nozzle of both sides.

---

[Translation done.]

\* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

---

DESCRIPTION OF DRAWINGS

---

[Brief Description of the Drawings]

[Drawing 1] The sectional view of the 1st example concerning this invention

[Drawing 2] Similarly it is the top view of the cavity plate.

[Drawing 3] The sectional view of the 2nd example concerning this invention

[Drawing 4] The sectional view of the conventional example

[Drawing 5] Similarly it is the top view of the cavity plate.

[Description of Notations]

2 Nozzle

5 Pressurized Room

7 Ink Reservoir

9 Diaphragm

10 Piezoelectric Device

12 Supply Fixture

13 Hole

14 Cavity Plate

15 Lobe

16 Front-End Space

22 Supply Fixture

23 Hole

24 Cavity Plate

25 Lobe

26 Front-End Space

---

[Translation done.]

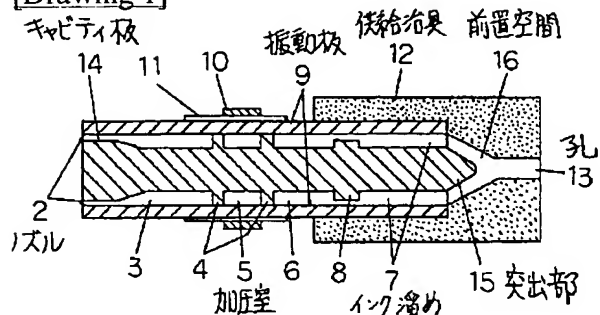
## \* NOTICES \*

JPO and NCIP are not responsible for any damages caused by the use of this translation.

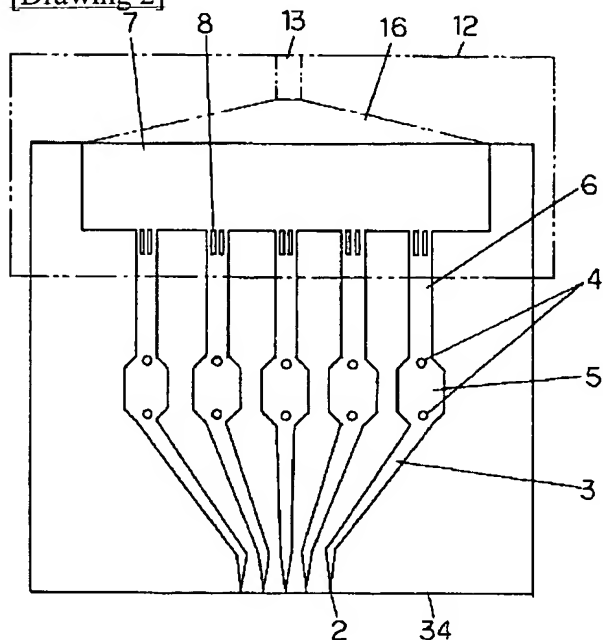
1. This document has been translated by computer. So the translation may not reflect the original precisely.
2. \*\*\*\* shows the word which can not be translated.
3. In the drawings, any words are not translated.

## DRAWINGS

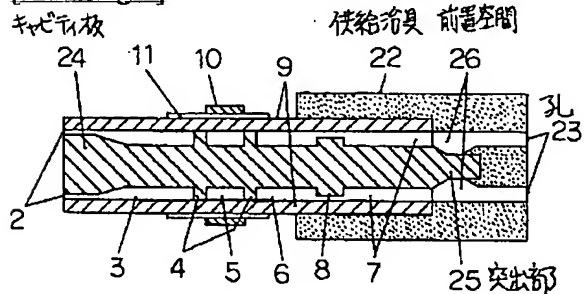
[Drawing 1]



[Drawing 2]



[Drawing 3]



[Drawing 4]



